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Sudan

PULP AND PAPER

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PULP AND PAPER

by

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Paper is one of the cornor-stones of civilization. It is required for dissemination of news, for the transfer of knowledge and for the preservation of history and experience in all forms of life. Cellulose may be regarded as the fibrous skeleton on which a sheet of paper is built. The raw material to be used will be determined from economic considerations as its technical suitability and also its availability in the country. The determining factors are an ample supply, available throughout the year, which will not deteriorate in storage. The field and quality of cellulose must be satisfactory, and the costs of conveying the material to the pulp mill, the processing costs, and the transport costs of conveying the finished products to the market are also paramount importance. When all these items are takem into consideration wood is found to be the outstanding world source of cellulose fibres, accounting for about 90% of world consumption. Straw, esparto grass, rags, bagasse and similar materials are however, used in considerable quantities, where they are found to be economically favourable. Other raw materials such as sulphur, limestone, rosin, alum, soda ash, salt cake and clay may be used in the industry according to the process.

The importance of paper to the economy of the Sudan can be seen by reference to the import figures given below:-

I T E M	1958 K.G.	1959 K.G.	1960 K.G.	1st 10 months of 1961 - K.G.
Newsprint paper	615,465	947,390	651,600	869,000
Wrapping & Packing	1,788,184	1,917,503	2,288,400	2,809,000
Printing Paper	501,746	818,521	448,800	926,000
Paper bags and containers	838,230	921,573	1,522,800	4,798,000
Writing Paper	890,750	1,262,598	1,411,000	1,390,000
Other Manufacture of Paper	4,151,000	5,337,000	3,582,000	3,688,000
Other Items			1,099,200	850,000
T O T A L	8,745,375	10,804,585	11,003,800	15,330,000

From this table we can see that there is a considerable increase every year in the total consumption of different types of paper. So investigations are made and a number of suitable raw materials have been found available in the Sudan, the most important ones are:-

Papyrus, Bagasse, Cotton Stalks, Esparto Grass, Sudanese Grass and Bamboo.

Papyrus

The Sudd region of the Sudan would appear to be one of the greatest unexploited sources of cellulose raw materials in the world. There is a dense area of papyrus growth of some 150 million tons covering an area of about 5,000 square miles and yielding approximately 45 tons to the acre. Furthermore since the plant grows to full height in just over 3 months, there is a possibility of 3 crops per year.

As long ago as 1910 (and again 1930) samples of papyrus were sent to the Imperial Institute, London, for experiments to show its value as a paper making material in comparison with esparto grass. The results obtained are recorded in the Bulletin of the Imperial Institute Vol.X-1912 as follows :-

" Papyrus from the Sudan and the East African Protectorate".

The sample of papyrus from the Sudan was stated to have been obtained from the mouth of the Bahr-el-Gabel. It consisted of five bundles of cut reeds, some of which were rather mouldy. That from the East Africa Protectorate. consisted of reeds varying in length from 6½ to 8 feet. The reeds had the characteristic appearance of papyrus, but were older, larger, and darker in colour than those from the Sudan.

The results of examination of the two samples are given in the following table, together with the corresponding figures for Algerian esparto grass :-

	Papyrus from East Africa	Papyrus from the Sudan.	Esparto grass from Iran Algeria
	Per cent	per cent	per cent
Moisture in material as received (on drying at 100° to 110° C)	16.3	13.8	8.8
Ash, calculated on the dried material	8.6	6.9	3.0
Unbleached pulp (dried at 100° to 110° C)= calculated on material as received	26.3	29.4	29.5
Calculated on dried material	31.4	34.2	32.3
Loss in weight of pulp on bleaching	2.3	2.9	1.3
Bleached pulp (calculated on dried material) ..	30.7	33.1	32.0
Length of ultimate fibres	From 0.01 to 0.14 in; average 0.052 in.	From 0.014 to 0.14 in: average 0.052 in	From 0.019 to 0.12 in; average 0.045 in.

It will be seen that the yield of pulp from the East African papyrus was slightly less than that from the Sudan Sample. The pulp was, however, of similar character and quality. Compared with esparto grass which was treated in the same way, the East African papyrus gives approximately the same proportion of pulp, but yields more ash, and the pulp loses more in weight on bleaching.

The papyrus from the Sudan had apparently lost about 74.0 percent of its original weight by the evaporation of moisture during transmit, and the material received at the Imperial Institute still contained 13.8 percent of moisture. It appears therefore, that the moisture in the fresh papyrus amounted to about 77.6 percent.

Paper-making trials were carried out with the two samples of papyrus at the Imperial Institute and the results showed that the manufactures of fairly good paper from this material is possible.

Later in the years 1930-33, bulk samples were tried out by two leading paper manufacturers in the United Kingdom using their standard processing plant. Both firms reported favourably

on ~~the~~ its suitability for high printing and writing paper.

Many enquiries followed up to 1939. These were concerned with the possible export to the United Kingdom of papyrus in the form of reeds in bales form and alternatively as paper pulp. Generally these enquiries broke down, not for technical reasons, but because manufacturers were already making paper from esparto grass, with machines designed for that particular purposes, and at a price with which papyrus, with its long haul from the upper reaches of the Nile, could show no advantage. It was never questioned that papyrus could not produce a paper of quality equal to, if not better than esparto grass.

Immediately after the war interest revived and uses for papyrus other than paper were discussed from time to time. Chief among these were as a fuel, for fibre board manufacture and as a course of chemicals (e.g. alpha cellulose). These again failed to produce anything tangible for economic rather than technical reasons.

The problems are largely ones of collections, transport and because of the relatively high costs, export opinion concluded that the only economic method was conversion into pulp on the spot,

In 1952, Mr. Howard, of Howard & Acrmis, Engineers, Bedford, England (who had designed machines for cutting swamp grasses in Uganda and Nyasland) interested himself in the collection problem. No produced a specification and drawing for a machine with the title "Sudd Cutting and Harvesting Machine".

In 1955, a Swiss Group, headed by Mr. Harrich Voglger visited the papyrus area and carried out chemical analysis and processing tests on samples from the district. Their conclusion was that a very satisfactory quality of cellulose and subsequently of paper, can be produced from papyrus. Other chemical raw material e.g. limestone are fortunately available in the Sudan and little would need to be imported.

During the years 1956-59, many enquiries and investigations were carried by various firms. Among these was a group of German firms who submitted an application to establish a paper factory in the Sudan. They projected to produce 8000 tons of all types of paper to meet the country's requirements. Estimated capital cost for all the project, including the papyrus collecting and transporting system, was LS.4 millions. The group was given approval in principal but again they failed to raise the necessary capital.

In the same year serious investigations were started by two local concerns i.e. the Arabian Company for Paper Manufacturing and Two Niles Cellulose and Paper Manufacturing Co. Both firms worked in close collection with German Consultants. Two teams of German experts flew to the papyrus area and carried detailed surveys and investigations in situ. Technical and economic reports were submitted to this Ministry which indicated beyond any doubt the economic feasibility of a Paper Industry in the Sudan. Both firms were given provisional approval to realise this important industry, but nothing serious has materialised yet.

Cotton Stalks:

Cotton is by far the most important crop in the Sudan. The greatest part of the crop is cultivated in the Gezira Scheme, whose beginning on a major scale dates from 1925. The total irrigated area is now about 1,557,000 feddans.

Various attempts have been made to utilize waste cotton stalks for the production of pulp and for other industrial purposes such as the manufacture of sacking materials, building materials etc. All such attempts came to end due to the fact that the Gezira cotton type can be infected with black arm and unless the stalks are burnt the probability of an infewtation for the next seasons crop cannot be eliminated. This has to

continue for some years and for such a time that other reliable methods for combating the disease, other than by burning the stalks, are found.

However, cotton resistant to black-arm disease, is grown in other regions of the Sudan, such as Upper Nile, the Gash and Tokar Delta (Kassala Province), Equatoria, Nuba Mountains, Gedaref and some other minor places. In these areas the chances fo for utilising cotton stalks are not handicapped.

For this reason the Government constructed a card-board factory at Aroma (Gash Delta) designed to utilise waste cotton stalks.

Extensive research on the utilisation of Gezira cotton stalks has been carried out by the Sudan Gezira Board, Barakat and Agricultural Research Division, Ministry of Agriculture.

Bagasse:

The Sudanese Government constructed a sugar factory in Blue Nile Province at (El Guneid). The accruing bagasse is to be used as fuel purposes. The quantity of sugar cane to be processed per day has been set at 4,000 tons. During the first year of operation production is to continue for a period of two months which would be equivalent to a processing of 240,000 tons of sugar cane. The cane has a fibre content of 12% which means that 240,000 tons of cane contain 28,800 tons fibres. On deducting 25% for inherent losses, there would be left 21,000 tons absolute dry fibre. With a yield of 40% it would be possible to manufacture 8,650 tons of pulp from this fibre. This would be sufficient to cover the requirements of the paper mill.

During the second year production at the sugar factory is continued through five months with a daily processing capacity of 4,000 tons of cane. In other words an estimated total of 600,000 tons of cane are to be harvested in the second

year. The capacity of the sugar factory in due course is to be doubled.

Even though the Arabian Paper Manufacturing Corporation shows little inclimination of utilising bagasse as raw material, the problem was on account of the certain availability of substance given certain consideration. Papyrus, on the other hand, involves great problems in harvesting and transportation.

With 25% losses due to waste, dust and pith the true price per ton of bagasse absolute dry would be LS.8.35. The costs of bagasse per ton of absolute dry pulp at yield of 40% would be LS.20.80. The only factors to be added are the transportation costs to the mill.

Other raw materials:

Bamboo: Bamboo grows in abundance in the South of the country, far distant, from the papyrus area. Its utilisation, however, would probably not be profitable. There is with the papyrus a type of bamboo with a maximum height of some 4 or 5 metres, a thickness, of only that of a human thumb. Its relative growth is probably some 5% of the papyrus of the area. There may be a possibility of utilising this bamboo for the paper and pulp, manufacture.

Esparto: It is available in abundance in the South of the country and is excellently suited for certain types of coated paper.

Sisal: It is also available in wide growth in the Southern Sudan. It would be possible, to start plantation of this plant in the vicinity of the mill and would thus ensure a supply of satisfactory raw material for sulphate paper domestically

Sudanese grass.

Grows in unbelievably large quantities near to Khartoum. Its harvesting and transportation to the mill would be possible at little expense. The pulp derived from this raw material is similar to a poor quality straw pulp. It has been submitted for

testing to our central laboratories.

As a matter of fact, many companies applied for an Approved Enterprises, so as to manufacture paper in the Sudan. This is something natural as we have a lot of raw materials which show to be satisfactory in paper production and also as the demand of the country is in a noticeable increase in every year.

The table shows the companies which will manufacture paper :-

Approved Enterprises for Paper Manufacture

And Other Allied Products:

Factory	Material used	Production	Remarks
1) Government Cardboard Factory	Cotton Stalks	4000 tons of cardboard annually	will go in production shortly
2) National Paper Industries	Waste Paper	3000 tons of wrapping and packing paper annually.	" "
3) Ahmed Saeed Baashar	" "	1500 tons of wrapping paper annually.	Not in Production
4) The Two Miles Cellulose & Paper Manufacturing Co.	Papyrus	18,000 tons of paper and Cellulose annually.	" "
5) Arabian Co. for Paper Manufacture	"	10,000 tons annually paper and cellulose	" "
6) Gabir Abul Izz	Cotton Stalks	2000 tons annually of paper hardboard	" "
7) Hafiz El Barbary	Waste timber, wood shavings, etc.	1,700 tons annually	" "

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